2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

This chapter describes the proposed action and alternatives (potential actions) to the proposed action for leasing geothermal resources on public lands.

2.1 PROPOSED ACTION

The Nevada BLM is considering leasing geothermal resources on public lands within the WFO administrative boundary and within the Dixie Valley KGRA (the Dixie Valley KGRA is administered by the BLM CCFO). Leasing would comply with the Winnemucca BLM Paradise-Denio, Sonoma-Gerlach MFPs and the Consolidated Resource Management Plan (CRMP) for the Carson City Field Office. Lease applications located within the Black Rock Desert – High Rock Canyon Emigrant Trail National Conservation Area (NCA), tribal lands, wildlife refuges, ACECs, and wilderness or wilderness study areas are not being considered.

The proposed action is to consider leasing all or some of the geothermal resources within PVAs, KGRAs, and pending lease sites as identified in Figure 2-1 (for greater detail, refer to Appendix A). All pending and future geothermal resource leases within these assessment areas would be subject to stipulations, mitigation measures, or performance standards developed from this analysis. Future lease applications would require a cultural resources inventory, and wildlife and sensitive and threatened and endangered species surveys within the WFO administrative boundary prior to leasing. Existing leases or other valid existing geothermal rights within the assessment area would not be subject to the stipulations, mitigation measures, or performance standards developed in this analysis; however, they would be subject to the above should the leases be dropped and leased again.

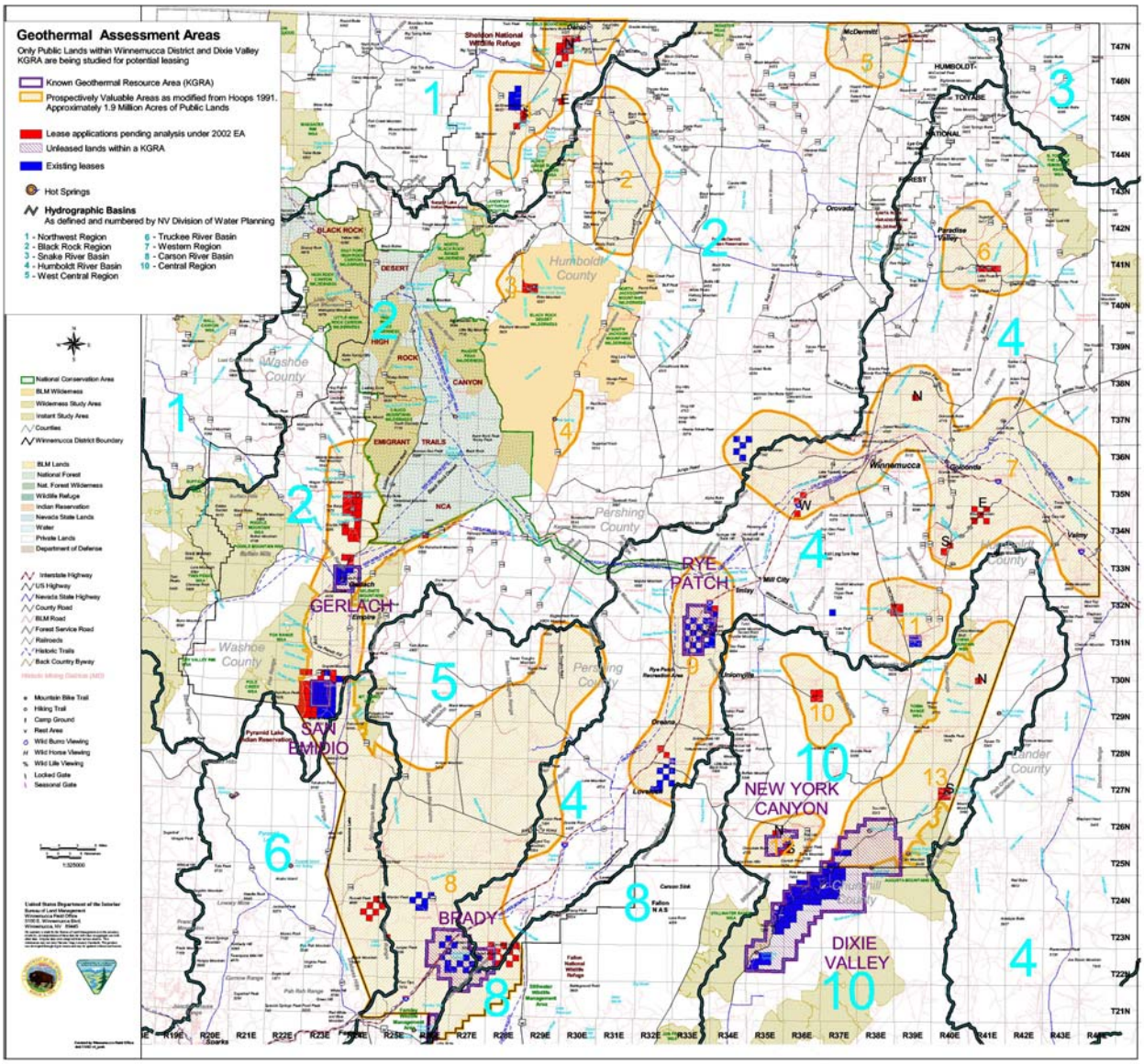
2.2 ALTERNATIVE TO THE PROPOSED ACTION

2.2.1 No Action Alternative

Under this alternative, all or some of the future leases for geothermal resources would be analyzed using the currently approved geothermal EA, *Winnemucca District Regional Geothermal/Oil and Gas Leasing Environmental Assessment (EA-NV-020-2-38), N-11821, June 1982* and policy guidelines titled: *Stipulations for Oil and Gas and Geothermal Leases, Winnemucca Office Instruction Memorandum No. 84-160 (3/84).* The No Action Alternative would be consistent with existing land use plans for the BLM WFO and CCFO. Processing leases under the No Action Alternative would require a supplemental NEPA analysis.

Note: For a comparison between the Proposed Action and No Action Alternatives, refer to Table 2-1.

FIGURE 2-1
WINNEMUCCA FIELD OFFICE ASSESSMENT AREAS



Note: For greater detail, click here (19.6 MB) or refer to Appendix A (9.8 MB) for smaller sectional maps.

2.2.2 Alternative Considered but Eliminated from Detailed Analysis

No Lease Alternative

The No Lease Alternative would not allow leasing of any geothermal resources within the WFO administrative boundary and the KGRA within the CCFO administrative boundary. Under this alternative, all pending and future geothermal lease applications would not be approved so as to preclude any and all environmental consequences. This alternative would not comply with the WFO MFPs and the CRMP applicable to the CCFO; these plans allow for leasing for geothermal

resources except in certain identified areas. This alternative would also be inconsistent with the President's National Energy Policy and Executive Order 13212. Consequently, the No Lease Alternative was not carried forward in this analysis.

TABLE 2-1
COMPARISON OF ALTERNATIVES

Purpose and Need Indicators	Output	
	No Action Alternative	**Proposed Action**
Conformance with the Sonoma-Gerlach and Paradise-Denio Management Framework Plans	X	X
Conformance with the Carson City Consolidate Land Use Plan (Dixie Valley KGRA only)		X
No surface occupancy stipulations apply to the following:		
Visible remnants of the Applegate-Lassen Trail from Rye Patch Reservoir to the Western Pacific Railroad near Trego	X	X
Sage grouse strutting grounds	X	X
S-1 cultural sites (National Historic Register Eligible sites)	X	X
George Lund Petrified Forest	X	X
Soldier Meadows Desert Dace ACEC	X	X
The following will be leased with special stipulations:		
West arm of the Black Rock Playa	X	X
Critical wildlife habitats	X	X
New/revised lease stipulations		X
Updated EA to comply with current NEPA requirements, CEQ regulations, and BLM policy		
Migratory Birds		X
Invasive non-native species	Partial	X
Socio-Economic and Environmental Justice		X
Wilderness/WSA		X
Native American religious concerns	Partial	X
Threatened and endangered species – wildlife		X
Sage grouse	Partial	X
Cumulative Impacts	Partial	X

2.2.3 Reasonably Foreseeable Development Scenarios

Although the process of leasing geothermal resources does not directly impact the human environment, future or reasonably foreseeable future development scenarios would result in surface disturbance to some of the lands post-leasing. The reasonably foreseeable development scenarios disclose indirect future or potential impacts that could occur once the lands are leased. The BLM would require a site-specific environmental analysis at the exploration and development stages in order to comply with NEPA.

Four separate and sequential phases of geothermal development could occur. The probable sequence and degree of environmental impact would be contingent upon the success or failure of each preceding phase. The four phases are exploration, development, production, and close-out.

Exploration. This stage includes all activities to explore for geothermal resources. The discrete actions or identifiable actions, which in the aggregate comprise this stage, include geologic, geochemical, and geophysical surveys. Cross-country vehicle travel could occur in order to complete the surveys. After the surveys have been completed, road building and drill pad construction could occur in order to drill temperature gradient and exploration wells.

Geologic, Geochemical, and Geophysical Surveys. These surveys consist of analyzing the surface geology and collecting water samples from hot springs. Based on the geologic and geochemical analysis, inference could be made as to where higher temperature gradients could occur. This work usually covers a broad surface area. Typically, geologic and geochemical surveys cause minimal surface disturbance.

Drilling Temperature Gradient Wells. The next step in exploration is to confirm where higher temperature gradients occur—this is done by drilling temperature gradient wells. These wells are narrow in diameter and are drilled to depths of several hundred to several thousand feet and include road building and drill pad construction. When completed, the operator lowers a thermistor down the well to measure how much the temperature gradient increases with depth. An operator could not produce any fluids out of, or inject any fluids into a temperature gradient well.

Drilling Exploration Wells. After the exploration data has been evaluated, one or more exploration wells could be drilled to a depth of several hundred to several thousand feet, in order to test the prospect. These wells could be flow tested. Each well could disturb approximately one acre. A new road could be constructed into the site.

An operator could drill several gradient wells on a lease to determine the extent of the temperature anomaly and where the highest temperature gradient occurs. Well pads are about .07 acres (55 feet by 55 feet) in size. Typically these wells are located adjacent to existing roads; however, new road construction could be necessary.

Development. This could include the development of a geothermal electric generating plant, direct use facilities, such as green houses or dehydration plants, or a combination of the two. At this stage is where most of the intense activities occur. The producing limits of the field(s) are

determined by developmental drilling. Because of the intense drilling at this time, more surface disturbance to construct roads and drill pads would occur. Drilling of production wells would be initiated. Other facilities that would be constructed include pipelines, power plants, electric transmission line construction, greenhouses, dehydration plants, cooling ponds, and warehouse and maintenance facilities. Generally, prior to initiating development scenarios, geothermal developers secure contracts with power companies that allow connection to local electrical grids.

Road Construction. Often new access roads to well pad sites must be built. These roads are usually a half-mile to three miles in length.

Drill Site Construction. Compared to exploration drilling, a well pad for a production well is usually much larger, approximately two acres (300 feet by 300 feet) in size. The number of wells drilled depends on the geothermal resource available. In general, one or two production wells would be drilled.

Geothermal Pipelines. Geothermal pipelines are usually 24-36 inches in diameter and covered with insulation, and would parallel the access road when possible and could be one to four miles in length.

Power Plant and/or Direct-Use Facility Construction. Electrical generation plants would range in generating capacity from 3–25 megawatts. The plant and other required facilities would occupy up to 30 acres. Direct use facilities could include construction of greenhouses or vegetable dehydration plants and other facilities such as cooling ponds. These facilities could occupy up to 5–30 acres.

Electric Transmission Line Construction. Electric transmission lines could range in length from 5-50 miles. They would most likely be supported by wooden poles. Typically a substation also is required to be constructed in conjunction with electrical transmission lines.

Miscellaneous Support Facilities. These facilities could include communications, septic systems, fresh water distribution, cooling towers, etc.

Production. The production stage involves the continued operation and maintenance of the field(s) and includes: new drill sites, maintenance of existing facilities, waste disposal, and geothermal energy production.

Close-Out. The close-out stage involves abandonment after production ceases and includes the following discrete operations: surface equipment removal, capping and cementing drill holes and wells, and surface rehabilitation. All surface disturbances must be reclaimed to BLM standards. Reclamation includes removing all facilities, and re-grading and re-contouring all surface disturbances to blend with the surrounding topography and seeded.

2.3 REASONABLY FORESEEABLE DEVELOPMENT SCENARIO GENERAL ASSUMPTIONS

For the purpose of this analysis, it is assumed that five, 15-megawatt power plants would be developed within the assessment areas.

2.3.1 Surface Disturbance

Exploration. During the exploration stage, surface disturbance is minimal with few adverse impacts until the decision is made to drill one or more exploration wells. An exploration-drilling model is shown below which lists the maximum degree of surface disturbance expected during this phase. This and other models, which follow, tend to maximize the degree of surface disturbance that could occur.

Up to three temperature gradient and/or exploration wells could be drilled on each lease. This would disturb up to approximately three acres. Three new access roads, each a half-mile in length would disturb approximately 1.5 acres. Total disturbance per lease is approximately 4.5 acres (see Table 2-2).

TABLE 2-2
ASSUMPTION REGARDING SURFACE DISTURBANCE
FOR GEOTHERMAL EXPLORATION

Activity	Area Of Disturbance (Acres)
Exploration Roads	Approximately 1 acre/mile
Shallow Temperature Gradient or Exploration (several 100 to several 1000 feet deep)	Approximately 1 acre/drill site

Development. The following model illustrates construction activities required to develop five, 15-megawatt electrical power generating plants, associated wells, pipelines, roads, and electrical transmission lines. The number of wells includes those used for production, standby, and re-injection. Since development is likely to occur in about 5-megawatt increments over a period of several years, the degree of surface disturbance at any given time is less than assumed in the model. Mitigation and enhancement would have occurred in some portions of the lease before additional portions of the lease are developed.

Up to six production or injection wells could be drilled on each lease. Each well pad would disturb approximately 5 acres, and a mainline road would disturb approximately 10 acres. Each of three pipelines would disturb approximately 5 acres and each of three access roads would disturb approximately 7 acres. A power plant would occupy approximately 30 acres, a disposal pond would disturb approximately 5 acres, and a 25-mile transmission line would disturb

approximately 10 acres. Total surface disturbance for each plant for this phase of operation would total approximately 121 acres (see Table 2-3).

TABLE 2-3
SURFACE DISTURBANCE EXPECTED TO RESULT
FROM DEVELOPMENT OF FIVE, 15-MEGAWATT POWER PLANTS

Feature	Features/Plant	Disturbed Acres/Feature	Total Disturbed Acres
Power Plant	1	30	150
Well	6	5	150
Cooling Ponds	1	5	25
Pipelines	3	5	75
Access Road (spurs)	3	7	105
Mainline Road	1	10	50
Transmission Line	1	10	50
TOTAL			605

The time frames for a typical geothermal project are estimated as follows.

Exploration: 1 to 5 years
Development: 2 to 10 years
Production: 10 to 30 years (depending on the time required in the construction of geothermal power producing facilities)

Until actual geothermal exploration and development begin, it is difficult to quantify the resource potential and possible future intensified production measures necessary to develop the resources. In order to assess environmental impacts resulting from an action as general as geothermal exploration, development, and production, it is necessary to assume given levels of intensities of such development.

Several models were assumed which describe the major processes and actions involved in the various stages of lease implementation. These models serve as the baseline against which to analyze impacts on the existing environment.

2.3.2 Geothermal Fluid Production and Associated Waste Production

Geothermal fluid production and associated waste production is likely to occur for short periods as wells are tested to determine reservoir characteristics. If geothermal fluids are discovered in commercial quantities, development of the geothermal field is likely.

The rate of fluid production from a geothermal reservoir is unknown until the development-testing phase is completed. During the initial stages of testing, one well is likely to be tested at a time. If testing is successful and the well and reservoir are sufficient for development, wellheads, valves, and control equipment would be built on top of the well casing.

Using data from other areas of geothermal development, it appears that production of geothermal fluids could be expected to vary from 1-6 million gallons per day, per well. Assuming 5 million gallons per day, per well as an average production figure, a lease with two producing wells would produce 10 million gallons of fluid per day.

Most geothermal fluids produced are re-injected back into the geothermal reservoir, via re-injection wells. In flash steam facilities about 15-20 percent of the fluid would be lost due to flashing to steam and evaporation through cooling towers and ponds. Binary power plants[6] are non-consumptive and utilize a closed loop system. Fluids could also be lost due to pipeline failures or surface discharge for monitoring/testing the geothermal reservoir.

[6] In binary power plants, the hot geothermal fluid is used to heat a separate, binary fluid in a heat transfer process. The binary fluid flashes at a lower temperature and is used to turn the power generating turbines.